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SCIENCE PROCESS SKILLS AND MOTIVATION

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Abstract

Purpose of the study: The purpose of this research is to know the science process skill and motivation of the basic science process from Physics education student.

Methodology: The research design used in this study is the Associative Quantitative research method with a correlational research design. In the research using technique sampling used is Purposive Sampling. The instruments of data collection used are questionnaires motivation and observation sheet Sains Process Skills. Measurement of students' science process skill is done when students perform Basic Physics I practice on density topic. The criteria that researchers set were physics education students who had contracted basic physics courses.

Main Findings: The result of the research stated that the basic science process skill of physics education student as a whole is not good because of lack of experience in doing a practicum and their understanding of lab topics.

Applications of this study: When someone is highly motivated, they will not experience difficulties in mastering their science process skills and so if someone has low motivation, they will experience difficulties in their process skills.

Novelty/Originality of this study: The renewal that is seen is whether there is motivation in the science process skills. There is motivation in student learning processes, one of the results is process skills. Process skills are the result of learning from these students. Because science process skills emphasize the learning process, accreditation, creativity, values and also the attitude of a student who will later be applied in daily life. Therefore we can say that science process skills have a relationship with the motivation of a student.

Keywords: *Science Process Skill, Basic Science Process Skill, Density, Physic Teacher, Motivation.*

INTRODUCTION

In learning, attitude is also an aspect that deserves to be taken into account. In the learning process, especially in physics lessons, participants' attitudes are important to be rejected (Astalini et al, 2019). The attitudes of the process are very important (Kurniawan, Astalini, & Anggraini, 2018; Astalini et al, 2018). Because, students who have this view will have different attitudes, with students who have a positive outlook during the learning process (Astalini et al, 2019). One of them is motivation. According to Higgins & Kruglanski, (2000) in general, motivation means something that encourages to do or act. Motivation can be interpreted as the strength (energy) of people who have a level of persistence and enthusiasm in carrying out activities, both from within the individual (intrinsic motivation) (Higgins & Kruglanski, 2000). For example, students have their own willingness to study physics, are able and concentrate while studying physics Higgins & Kruglanski, (2000). And from outside the individual (extrinsic motivation), likes to get prizes and get good grades (Higgins & Kruglanski, 2000). Students who have a negative attitude towards physics have less motivation for class involvement, and also students who have a positive attitude towards physics have motivation for class involvement (Guido, 2013).

With the views of these students, science will develop process skills from students. Dogan (2016), Define science process skills as skills that facilitate learning sciences, the award means of research and active learning, develop individual's sense of responsibility while learning, and increase the permanence of knowledge. Behera (2014), Used the term 'process skills' to refer to the processing strategies that a person brings to bear in solving a problem. Rezba, et al (2003), They are the things that scientists do when they study and investigate. Scientific process skills are needed in solving scientific problems. Because teacher must have science process skills, it is a skill used by scientists when conducting scientific investigations (Mutisya, Rotich & Rotich, 2013; Darmaji et al, 2018).

Science process skills consist of basic and integrated science process skills. In this article only discuss basic process skills. Basic science process skills apply specifically to foundational cognitive functioning in especially the elementary grades, Rambuda & Fraser (2004). In addition, these skills also increase problem-solving capacity and form the basis of more advanced skills. Rezba et al (2003) is part of basic process skills observing, communicating, classifying, measuring metrically, inferring, predicting. Rezba et. al (2003), Basic skills are the basis for more complex integrated skills. Science process skills are important to implement because. First, the development of science is accelerating so that it is no longer possible for teachers to teach facts and concepts to students. Second, there is a tendency for students to easily understand complex concepts if accompanied by concrete examples. Third, the discovery is not absolute but is relative, so it can be refuted if someone gets new data that is able to prove mistakes (Semiawan, 1992; Darmaji et al, 2018). So basic science process skills are essential to be improved. This is based on basic science process skills that can help students solve problems well and be able to interact well with each other.

LITERATURE REVIEW

Rezba, et al (2003), they look for patterns of objects observed using their senses. They classify equations and differences to form new concepts, they communicate what they are able to do and what they know is good both orally and in writing. They take measurements and conclude the results obtained to become new information. then predict possible outcomes before they actually observe. So that it can be said that science process skills are related to one another.

Feyzioglu (2012), The best way to measure the SPS of students is laboratory reports, oral presentations, and observation. Buyuktaskapu, et al (2012); Mayasari, Syamsurizal, & Maison, (2015), In this study, point out that Processing Skills necessary for children to do scientific research can be developed. Skills of students' science processes can be seen from practicum activities because in practicum activities involve students in the use of laboratory tools that are used to discover the concept of physics for both individuals and groups. the result of the lecturer's evaluation stated that there are still many obstacles faced by students in the process of practicum implementation. The research that has been done by Kuswanto (2017), students' science process skills in the lab is still very low. With such circumstances, it means that the students have not been able to independently perform their practical activities and have little initiative in solving their lab problems.

Khabibah, MasykuriM, & Maridi (2017) Based on the Science Process Skills of students who are highly unskilled, the factors that affect the student's Science Process Skills, the initial experience of students before the basic physics lab is still small, the students' knowledge about the concept in the practicum topic, the availability of practicum tools and the practicum guidance that is not train Science Process Skills. Meerah (2002) What is crucial is the quality of the experiences that students have there. In a similar vein, the finding of research on the understanding of the nature of scientific inquiry is as negative as those for conceptual understanding. Students should have practicum experience from teachers while students are still studying in high school because of the ability of teachers in teaching the topic to be a student's stock when a student at the university. In addition, A practicum guide as one of the learning resources in practicum activities should be a guide for students in developing science process skills. One of the efforts to improve the students' science process skills in a lab is to create a practical guide using a learning model. Sagala, et.al (2017), Skills of students' science processes taught with problem-based learning model is better than students taught by conventional learning in physics learning. Turan and Demirel (2011), Implementing learner-centered approaches in the early stage of education might be helpful in attaining life-long learning skills and effective attributes. Inel & Balim (2010), it can be argued that the use of the problem-based learning method in science teaching is more effective in enhancing students' ability to learn the concepts by constructing them in their minds, rather than simply using the science and technology curriculum. Science process skill can improve by using practical guide based problem-based learning.

METHODOLOGY

Research design

The research design used in this study is the Associative Quantitative research method with a correlational research design. Associative quantitative research is research that aims to determine the relationship between two or more variables (Cohen, Manion, & Marrison, 2005). Because the research is associative research, the researcher took a correlational research design. According to Creswell (2012) "Correlational Design is a procedure in quantitative research that is used by researchers to measure the degree of association (relationship) between two or more variables using statistical analysis correlation procedures".

Research subject

The sample of this research are students of Physics Education Study Program of Universitas Jambi that was taken using a purposive sampling technique with the number of samples obtained by 130 students. Purposive sampling is a technique sampling based on the criteria of the researcher (Kerlinger, 2014). The criteria that researchers set were physics education students who had contracted basic physics courses.

Instrument

In this study, the study used questionnaire instruments and observation sheet wherein the motivational questionnaire adapted from Elok Sudibyo (2017) has 23 valid statements with 12 indicators that have Cronbach alpha reliability value of 0.86. In this study, for process skills used 6 indicators, using a Likert scale 5 (five) for positive statements Strongly Disagree having a score of 1, Disagree having a score of 2, Natural has a score 3,Agree has a score of 4 and Strongly Agree 5. For negative statements Strongly Disagree has a score of 5, Disagree has a score of 4, Natural has a score of 3 Agree has a score of 2 and Strongly Agree has a score of 1.

The data in this study used quantitative analysis data using the SPSS program to look for descriptive and inferential statistics. Descriptive statistics are a description or presentation of large amounts of data, in this case in the form of summary frequencies, for example, mode, mean, median, minimum, maximum and standard deviation (Cohen, Manion & Morrison, 2005). Statistical inference from mathematical procedures for using probabilities and information about samples

to draw conclusion about the population from which the sample is presumably was drawn (Gall, 2003). In this study there is a prerequisite test and hypothesis test, the prerequisite test used is the normality test and linearity test, and for testing the hypothesis using product-moment correlation.

Below are categories of motivation questionnaires and observation sheets of science process skills.

Table 1: Characteristics of Motivation and Science Process Skills

Category	Interval					
	Motivasi	Science Process Skills				
		Observing	Classifying	Predicting	Inferring	Measuring
Very Not Good	23.0 - 41.4	19.0 –34.2	8.0 –14.4	3.0 – 5.4	12.0 – 21.6	6.0 – 10.8
Not Good	41.5 - 59.8	34.3 – 49.4	14.5 – 20.8	5.5 – 7.8	21.7 – 31.2	10.9 – 15.6
Enough	59.9 - 78.2	49.5 – 64.6	20.9 – 27.2	7.9 – 10.2	31.3 – 40.8	15.7 – 20.4
Good	78.3 - 96.6	64.7 – 79.8	27.3 – 33.6	10.3 – 12.6	40.9 – 50.4	20.5 – 25.2
Very Good	96.7 – 115.0	79.9 – 95.0	33.7 – 40.0	12.7 – 15.0	50.5 – 60.0	25.3 – 30.0

Source: Widoyoko (2016)

RESULTS

The renewal that is seen is what is suggested in the skill process. There are those who learn in the learning process of students, one of the results of the process. Process skills are the learning outcomes of these students. Because science process skills emphasize the learning process, activity, creativity, values and also the attitude of students that will be applied in everyday life. Yuniastuti (2013); Prayitno et al. (2017) Skills in science processes can also involve the motivation of students who need peer tutoring to do. So we can say, the process of science skills has a relationship with the motivation of all students.

Measurement of students' science process skill is done when students perform Basic Physics I practice on density topic. The result can be seen below.

Descriptive Results of Observing On Density Topic

The results of the observation sheet data obtained for indicators of observing on density in the table. 2 below:

Table 2: Results From Measuring On Observing Topic Students Of Physics Education Study Program Of Universitas Jambi

Category					Mean	Min	Max	%
Interval	Female	Male	Attitude	Total				
19.0 – 34.2	0	0	Very Not Good	0				0.0
34.3 – 49.4	2	4	Not Good	6				4.7
49.5 – 64.6	38	32	Enough	70	52.0	35	91	53.8
64.7 – 79.8	27	21	Good	49				37.7
79.9 – 95.0	4	1	Very Good	5				3.8
TOTAL	72	58		130				100

From table 2, which came from 130 respondents from Students of physics education study program of Universitas Jambi have a Mean 52.0, Maximum Value 91, and Minimum Value 35. Of 130 respondents for male students categorized enough with the number 32 then for female as many as 38 with enough categories, and processed results using the SPSS program application, it was obtained observing on density topic to have a sufficient category of 53.8% for 70 a total of 130 students, good at 37.7% for a total of 49 out of 130 students. Very Good at 3.8% for a total of 5 out of 130 students and Not Good at 4.7% for a total of 6 out of 130 students.

Descriptive Results of Classifying On Density Topic

From table 3, which came from 130 respondents from Students of physics education study program of Universitas jambi have a Mean 26.3, Maximum Value 38, and Minimum Value 15. Of 130 respondents for male students categorized good with the number 25 then for female as many as 47 with good categories, and processed results using the SPSS program application, it was obtained observing on density topic to have a good category of 55.4% for 72 a total of 130 students, enough at 41.5% for a total of 54 out of 130 students. Very Good at 2.3% for a total of 3 out of 130 students and Not Good at 0.8% for a total of 1 out of 130 students.

The results of the observation sheet data obtained for indicators of classifying on density in the table. 3 below:

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Table 3: Results From Classifyng On Density Topic Students Of Physics Education Study Program Of Universitas Jambi

Category					Mean	Min	Max	%
Interval	Female	Male	Attitude	Total				
8.0 – 14.4	0	0	Very Not Good	0				0.0
14.5 – 20.8	0	1	Not Good	1				0.8
20.9 – 27.2	24	30	Enough	54	26.3	15	38	41.5
27.3 – 33.6	47	25	Good	72				55.4
33.7 – 40.0	1	2	Very Good	3				2.3
TOTAL	72	58		130				100

Descriptive Results of Predicting On Density Topic

The results of the observation sheet data obtained for indicators of predicting on density in the table below:

Table 4: Results From Predicting On Density Topic Students Of Physics Education Study Program Of Universitas Jambi

Category					Mean	Min	Max	%
Interval	Female	Male	Attitude	Total				
3.0 – 5.4	1	4	Very Not Good	5				3.8
5.5 – 7.8	3	6	Not Good	9				6.9
7.9 – 10.2	30	23	Enough	51	8.0	2	14	39.2
10.3 – 12.6	28	17	Good	47				36.3
12.7 – 15.0	10	8	Very Good	18				13.8
TOTAL	72	58		130				100

From table 4, which came from 130 respondents from Students of physics education study program of Universitas Jambi have a Mean 8.0, Maximum Value 14, Minimum Value 2. Of 130 respondents for male students categorized enough with the number 23 then for female as many as 28 with enough categories, and processed results using the SPSS program application, it was obtained observing on density topic to have a sufficient category of 39.2% for 51 a total of 130 students, good at 36.3% for a total of 47 out of 130 students. Very Good at 13.8% for a total of 18out of 130 students Not Good at 6.9% for a total of 9 out of 130 students, and Vey Not Good at 3.8% for a total of 5 out of 130 students.

Descriptive Results of Inferring On Density Topic

The results of the observation sheet data obtained for indicators of inferring on density in the table below:

Table 5: Results From Measuring On Inferring Topic Students Of Physics Education Study Program Of Universitas Jambi

Category					Mean	Min	Max	%
Interval	Female	Male	Attitude	Total				
12.0 – 21.6	0	0	Very Not Good	0				0.0
21.7 – 31.2	2	4	Not Good	6				4.6
31.3 – 40.8	31	18	Enough	52	45.0	25	57	40.0
40.9 – 50.4	34	33	Good	64				49.2
50.5 – 60.0	5	3	Very Good	8				6.2
TOTAL	72	58		130				100

From table 5, which came from 130 respondents from Students of physics education study program of Universitas Jambi have a Mean 45.0, Maximum Value 57, and Minimum Value 25. Of 130 respondents for male students categorized good with the number 33 then for female as many as 34 with good categories, and processed results using the SPSS program application, it was obtained observing on density topic to have a good at 49.2% for a total of 64 out of 130 students, enough category 40.0% for 52 a total of 130 students, Very Good at 6.2% for a total of 8 out of 130 students, and Not Good at 4.6% for a total of 6 out of 130 students.

Descriptive Results of Measuring On Density Topic

From table 6, which came from 130 respondents from Students of physics education study program of Universitas Jambi have a Mean 18.0, Maximum Value 29, Minimum Value 8. Of 130 respondents for male students categorized enough with the number 25 then for female as many as 34 with enough categories, and processed results using the SPSS program application, it was obtained observing on density topic to have a sufficient category 42.3% for 55 a total of 130 students, good at 36.2% for a total of 47 out of 130 students. Very Good at 10.7% for a total of 14 out of 130 students Not Good at 6.2% for a total of 8 out of 130 students, and Very Not Good at 4.6% for a total of 6 out of 130 students.

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The results of the observation sheet data obtained for indicators of measuring density in the table below:

Table 6: Results From Measuring On Density Topic Students Of Physics Education Study Program Of Universitas Jambi

Category					Mean	Min	Max	%
Interval	Female	Male	Attitude	Total				
6.0 – 10.8	2	4	Very Not Good	6				4.6
10.9 – 15.6	4	4	Not Good	8				6.2
15.7 – 20.4	34	25	Enough	55	18.0	8	29	42.3
20.5 – 25.2	22	21	Good	47				36.2
25.3 – 30.0	10	4	Very Good	14				10.7
TOTAL	72	58		130				100

Motivation

The results of the questionnaire obtained for the motivation are described in the following table:

Table 7: Results from Motivation Students of Physics Education Study Program Of Universitas Jambi

Category					Mean	Min	Max	%
Interval	Female	Male	Attitude	Total				
23.0 - 41.4	0	0	Very Not Good	0				0.0
41.5 - 59.8	0	2	Not Good	2				1.5
59.9 - 78.2	32	25	Enough	58	15.0	7	25	44.6
78.3 - 96.6	33	28	Good	60				46.2
96.7 – 115.0	7	3	Very Good	10				7.7
TOTAL	72	58		130				100

From table 7, which came from 130 respondents from Students Of Physics Education Study Program Of Universitas Jambi has a Mean 15.0, Maximum Value 25, and Minimum Value 7. Of 130 respondents have a good category with a total of 28 for male, then for female as many as 33 in good category, and processed results using the SPSS program application, it was obtained for motivation to have a good at 46.2% for a total of 60 out of 130 students. Enough category 44.6% for a total of 58 out of 130 students, Very good at 7.7% for a total of 10 out of 130 students, and Not Good at 1.5% for a total of 2 out of 130 students.

The relationship between motivation and science process skills

The results from motivation and science process skills to basic physics practicum 1 are described in the following table.8 :

Table 8: The Relationship Students of Physics Education Study Program of Universitas Jambi

		Motivation	Science Process Skills
Motivation	Pearson Correlation	1	.697*
	Sig. (2-tailed)		.026
	N	130	130
Science Process Skills	Pearson Correlation	.697*	1
	Sig. (2-tailed)	.026	
	N	130	130

From the table 8, we can see that the sig value is 0.26 small from 0.05, it can be concluded that there is a relationship between motivation and science process skills of Students of Physics Education Study Program of Universitas Jambi with an R-value of 0.697 and positive. If the value of sig < 0.05 then there is a relationship (Gall, 2003)

DISCUSSION

The renewal that is seen is whether there is motivation in the science process skills. There is motivation in student learning processes, one of the results is process skills. Process skills are the result of learning from these students. Because science process skills emphasize the learning process, accreditation, creativity, values and also the attitude of a student who will later be applied in daily life. Yuniastuti (2013); Prayitno et al, (2017) Science process skills can also cause motivation in a student even though he needs a peer tutor to do it. Therefore we can say that science process skills have a relationship with the motivation of a student.

Science Process skill is very important in scientific learning. Karamustafaoglu (2011), science process skills build a research-based laboratory application framework. This makes students feel meaningful learners, can build the information they get through science process skills. Research-based learning is better than having students memorize concepts. This is based on laboratory research-based learning that allows students to improve their science process skills, can solve problems independently, are able to find answers to their own questions and develop critical thinking skills.

Practicum is an important element in science teaching. Jirout & Zimmerman, (2015), Students can develop process skills and can solve their problems through practicum activities. Practical circumcision is a learning activity found in science subjects that can foster a sense of curiosity, scientific attitude and provide training for students' scientific process skills. Practical activities guided by competent teachers with both scientific equipment and procedures are very important aspects of scientific training. in addition, they also say that it is important for science teaching in schools to include labs as part of a learning program Chabalengula, Mumba, & Mbewe (2012). Where practicum has benefits among others, it can transform abstract concepts into concrete experiences, by involving students in the use of laboratory tools to find the concept of physics, so that the scientific process skills can be seen when practicum.

The results showed that students' science process skills are varied.

1. Observing

From the results, students have varied observing science process skills. Overall students have good observing skills. Students can observe tools of practicum.

Q: *How do you observe this density practicum?*

A: *I use my senses to make observations, I observe the tools to be used. I use my senses to make observations, I observe the tools to be used. I searched the literature before, so during the lab, I can compare what I read with what I see in the lab.*

From the interview results, it can be seen that students have good science process skills. assessment and use of numbers have the highest level followed by observation skills and classification skills, Karamustafaoglu (2011). Students can make good observations because observing is a basic science process skill. The ability of students to make an observation is also important for the development of other science process skills.

2. Classifying

From the results, students have varied Classifying science process skills. Overall students have good classifying skills.

Q: *Can you classify the tools to be used in the density practicum.*

A: *Yes, I can. after I do my observations directly classified the correct tools to use.*

From the interview can be seen that students can be classifying the correct tools to use. Karamustafaoglu (2011), When the answer given to the questions assessing each skill are investigated it was observed that the student teachers' skills on classification at the desired level. This skill allows students to understand the differences and similarities between items of study.

3. Predicting

From the results, students have varied predicting science process skills. Overall students have bad predicting skills.

Q: *Based on the lab work you have done, can you make a prediction?*

A: *I do not know how to make predictions.*

In my opinion, make that prediction is an abstract thing From the interview can be seen that students can't make a prediction. Karamustafaoglu (2011), the reason for this can be explained fact that predicting skills are more abstract than the others. Aydin (2013), Prediction is stating an opinion as to future events or expected situations basis of certain data. So, future results on the basis of observation, inference, and experimentation.

4. Inferring

From the results, students have varied Classifying science process skills. Overall students have good classifying skills.

Q: *Based on the lab work you have done, can you make a conclusion?*

A: *Based on existing data, of course, I can conclude the results of lab work.*

From the interview can be seen that students can make an inference. Aydin (2013), Making an inference is defined as making statements on the causes of the events that happened before based on observation. students can make an inference after observation and practicum.

5. Measuring

From the results, students have varied measuring science process skills. Overall students have bad measuring skills.

Q: *Can you make measurements on the density practicum?*

A: *I have never practiced density before. So, I don't know how to the measurement. while in school I have never practiced density.*

From the interview can be seen that students have no experience in measuring. Hirca (2013), Students learn science using methods and process of inquiry through direct experience. If students have a good experience in measuring before, students can do the measurement in density practicum.

6. Correlation motivation and social science skills

We can see that the sig value is 0.26 small from 0.05, it can be concluded that there is a relationship between motivation and science process skills Of Physics Education Study Program Of Universitas Jambi with an R-value of 0.697 and positive. If the value of sig <0.05 then there is a relationship (Gall, 2003). The purpose of the positive category itself is that there is a unidirectional relationship between the variables X and Y, namely motivation and attitude if the motivation rises, then the attitude rises, and if the motivation goes down his attitude also goes down. Then the intent of the negative category itself is the existence of a contradictory relationship between the variables X and Y, that is, if the motivation rises it is not necessarily the attitude rises, instead it goes down, and if the motivation goes down not necessarily the attitude goes down, but rises. This is in accordance with (Gall, 2003) r = -1 is a perfect negative correlation, meaning that there is a contradictory relationship between variables X and Y, if X rises / high then Y falls / low, while r = 1 is a perfect correlation, which means there is a relationship in the direction of variable X and variable Y, if X rises then Y rises or if Y drops then X drops.

Thiel (1976) claims that in all development, experience and maturation are necessary components, views thinking as a high-level skill whose higher-level forms must be acquired by practice. Ango (2002), the experience for school students in the science learning guide should include experiences that demonstrate process skills

From a theoretical point of view, experience has a very important role in the development of any skill. Thiel (1976), These experiences are also critical for achieving expertise in the meaningful use of scientific procedures for applying scientific understanding to one's own life. The student's experience in practicum affects his science process skills. Inexperienced students have poor science process skills in the lab.

In addition, other factors affecting the students' science process skills are poorly understood on the subject of the lab. The student interview result says: Q: Do you know about density practical? A: Density? Oh, I do not know about that. Q: So how can you do the practicum? A: I Do not know. Maybe I will ask my friends. From the interview result, it can be seen that the students' knowledge about density practical is still very less. Therefore, basic science process skill students less too. Aydogdu (2015), Basic process skills can be acquired from the preschool period.

So, for students in a university should not difficult to apply basic science process skill. But, the fact in university student basic science process skill is still very less. This is because when high school students are too often guided teachers in doing practical activities, the lack of variations of models and methods and media learning used in the learning process.

CONCLUSION AND SUGGESTION

Scientific process skills are influenced by experience, the ability to understand the topic and the quality of the teacher in delivering the topic. Based on the results of the research conducted, it can be concluded that the skills of the process of science are very important for students. Scientific process skills can be seen when a person performs an experiment. Overall basic science process skills of physical education students of Jambi University are still considered not good.

Suggestions from researchers In order to improve students' science process skills, it is necessary to conduct similar research that can improve the scientific process of physical education students, such as make new guide practical and repair the facilities and infrastructure in the laboratory.

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